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Analysis of global publications on tracheostomy between 1980 and 2021, including the impact of COVID-19: a bibliometric overview

COVID-19'un etkisi de dahil olmak üzere 1980 ve 2021 yılları arasında trakeostomi ile ilgili küresel yayınların analizi: bibliyometrik bir bakış

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ABSTRACT

Aim: The usage of tracheostomy and related studies have increased in recent years with the COVID-19 pandemic, however, there is not enough bibliometric study in the literature. This study aims to summarize scientific articles on tracheostomy.

Material and Method: Published articles about tracheostomy between 1980 and 2021 were analyzed using bibliometric and statistical methods. Articles were retrieved from the Web of Science database. Keyword network visualization maps were used to identify trending topics and collaborations. The Exponential Triple Smoothing estimator was used to forecast the possible number of future publications. Spearman's test was used for correlation studies.

Results: A total of 6274 publications were found. 3573 were articles. The top three countries were USA (n=1337), UK (n=361) and Germany (n=298). The top three institutions were Harvard University (n=67), University Michigan (n=50), University of Pennsylvania (n=40). The top three journals with the highest number of publications were Laryngoscope (n=189), International Journal of Pediatric Otorhinolaryngology (n=128), Otolaryngology-Head and Neck Surgery (n=121). According to the average number of citations per article, the top three most influential journals were Chest (70.2), Critical Care Medicine (66.5), and Journal of Trauma-Injury Infection and Critical Care (48.5).

Conclusion: This comprehensive bibliometric study summarized articles on tracheostomy. There is an increasing trend in the number of articles following the COVID-19 pandemic. This study showed that the need for tracheostomy may increase in epidemics which cause respiratory failure. This article can be a useful resource for clinicians and scientists.

Keywords: Bibliometric analysis, citation analysis, coronavirus, COVID-19, tracheostomy, trends

ÖZ

Amaç: Son yıllarda COVID-19 pandemisi ile birlikte trakeostomi kullanımı ve ilgili çalışmalar artmış olmakla birlikte literatürde yeterli bibliyometrik çalışma bulunmamaktadır. Bu çalışma, trakeostomi ile ilgili bilimsel makaleleri özetlemeyi amaçlamaktadır.

Gereç ve Yöntem: 1980-2021 yılları arasında trakeostomi ile ilgili yayınlanmış makaleler bibliyometrik ve istatistiksel yöntemlerle analiz edildi. Makaleler Web of Science veri tabanından alındı. Trend olan konuları ve işbirliklerini belirlemek için anahtar kelime ağ görselleştirme haritaları kullanıldı. Gelecek yıllardaki yayın sayısını tahmin etmek için Exponential Triple Smoothing tahmincisi kullanıldı. Korelasyon araştırma çalışmaları için Spearman's testi kullanıldı.

Bulgular: Toplam 6274 yayın bulundu. Bu yayınlardan 3573 makale idi. İlk üç ülke ABD (n=1337), İngiltere (n=361) ve Almanya (n=298) oldu. En aktif ilk üç kurum Harvard Üniversitesi (n=67), Michigan Üniversitesi (n=50), Pennsylvania Üniversitesi (n=40) oldu. En fazla yayına sahip ilk üç dergi Laryngoscope (n=189), International Journal of Pediatric Otorhinolaryngology (n=128), Otolaryngology-Head and Neck Surgery (n=121) idi. Makale başına ortalama atıf sayısına göre, en etkili üç dergi Chest (70,2), Critical Care Medicine (66,5) ve Journal of Trauma-Injury Infection and Critical Care (48,5) oldu.

Sonuç: Bu kapsamlı bibliyometrik çalışma, trakeostomi hakkındaki makaleleri özetledi. COVID-19 pandemisini takiben makale sayısında artış eğilimi vardı. Bu çalışma, solunum yetmezliğine neden olan salgınlarda trakeostomi ihtiyacının artabileceğini göstermiştir. Bu makale klinisyenler ve bilim adamları için faydalı bir kaynak olabilir.

Anahtar Kelimeler: Bibliyometrik analiz, alıntı analizi, coronavirus, COVID-19, trakeostomi, trendler

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INTRODUCTION

There is a significant increase in the number of patients who require mechanical ventilation. Tracheostomy is a frequently performed technique in critically ill patients who require long mechanical ventilation for acute respiratory failure and airway problems (1-3). Tracheostomy can also be used on traumatic neurological injuries requiring mechanical ventilation, upper airway obstruction, foreign body aspiration, etc (1,4).

Bibliometric is the analysis of scientific outputs in the literature using various statistical methods (5,6). In parallel with the increasing number of publications in the literature, bibliometric research and analyzes have been carried out on different medical subjects (5-12). Bibliometric studies can reveal past and current trends on a topic using citation analysis, bibliometric and statistical methods. Bibliometric studies can allow researchers to understand the literature briefly and can also highlight researches ideas for future studies (8-10).

Although the use of tracheostomy and the number of global studies have increased in recent years with the COVID-19 pandemic, there is not enough bibliometric study in the literature. This study aims to summarize the published scientific articles on tracheostomy between 1980 and 2021 and performs analyses using bibliometric and statistical methods. As a result of the analysis, we want to show the most effective studies on tracheostomy using citation analysis; to identify the most active authors, journals, institutions, and countries; to highlight possible cooperation between countries, and to identify past and current trend issues.

MATERIAL AND METHOD

Ethics committee approval is not required in this bibliometric study.

We have used the Web of Science database (WoS) (by Clarivate Analytics) for the literature review. Publication scanning was done only in the "title" section of the studies. Search keywords related to tracheostomy ("tracheostomy", "tracheotomy", "tracheostomies", "tracheotomies", "tracheostomied", "tracheotomied" etc.) were used for literature review in WoS. With this search method, all articles related to tracheostomy and other usage were obtained and downloaded from WoS. The following search criteria were used: Title: tracheostomy or tracheotomy; timespan: 1980-2021; indexes: SCI-Expanded, SSCI, A&HCI, CPCI-S, CPCI) -SSH, BKCI-S, BKCI-SSH, ESCI) (Access date: 25.10.2021).

VOSviewer (Version 1.6.17, Leiden University's Center for Science and Technology Studies) package program was used for bibliometric network visualizations and citation analysis. VOSviewer gave special importance to the graphical representation of large bibliometric networks. These networks may include journals, researchers, or individual publications. The networks can be constructed based on citation, bibliographic coupling, co-citation, or co-authorship relations (13).

The Exponential Triple Smoothing estimator in the Microsoft Office Excel (Version 2013, Microsoft) program was used to forecast the possible number of publications in the coming years based on past publication trends. The estimator use AAA (additive error, additive trend, and additive seasonality) version of the Exponential Triple Smoothing (ETS) algorithm. Statistical analyzes were performed with the SPSS (Version 22.0, SPSS Inc., Chicago, IL, USA) package program. The normal distribution of the data was tested with the Kolmogorov-Smirnov test.

The relationship between world publication productivity and economic development on tracheostomy was investigated. Economic development indicators; Gross Domestic Product (GDP) and Gross Domestic Product per capita (GDP per capita) were obtained from the World Bank (14). The correlation between the number of articles produced by countries and their economic development was evaluated with Spearman's correlation coefficient according to data distribution. A p-value of 0.05 or less is considered statistically significant.

RESULTS

As a result of the literature review, a total of 6274 publications on tracheostomy published between 1980 and 2021 were found in the WoS. The types of these publications are article (3573, 56.9%), meeting abstract (1030, 16.4%), letter (946, 15%), proceedings paper (282, 4.5%), review (213, 3.4%), and other types (230, 3.7%) (Editorial material, early access, note, book chapter, correction, news item, book review, discussion, poetry, retracted publication). Bibliometric analyzes were carried out with articles. 92.6% (3307) of these articles were in English, 4.2% (151) in German, 1.6% (58) in French, 0.8% (27) in Spanish, and the rest in other languages (Turkish (14), Portuguese (5), Russian (2), Slovenian (2), Chinese (1), Czech (1), Hungarian (1), Italian (1), Japanese (1), Korean(1), and Polish (1)). The h-index of articles was 91, the average citations per article was 15.22, and the sum of times cited was 54367 (without self-citations: 29275).

Active Research Areas

The top 10 research areas on tracheostomy were otorhinolaryngology (1054, 29.4%), surgery (846, 23.6%), critical care medicine (555, 15.5%), respiratory system (437, 12.2%), pediatrics (352, 9.8%), anesthesiology (340, 9.5%), general internal medicine (274, 7.6%), research in experimental medicine (222, 6.2%), clinical neurology (146, 4%), and cardiac cardiovascular systems (143, 4%)).

Development and Future Trends

The distribution of the number of published articles by year is shown in **Figure 1**. The estimated values of the ETS estimation model, which is used to estimate the number of articles that can be published in 2021 and beyond, are shown in **Figure 1**. The data collection phase was done before the completion of 2021, therefore the number of articles published in 2021 was excluded from the estimation model. According to the estimation model results, it is estimated that 329 (Confidence Interval (CI) %: 283-376) articles will be published in 2021 and 347 (CI%: 295-398) articles will be published in 2025 (**Figure 1**).

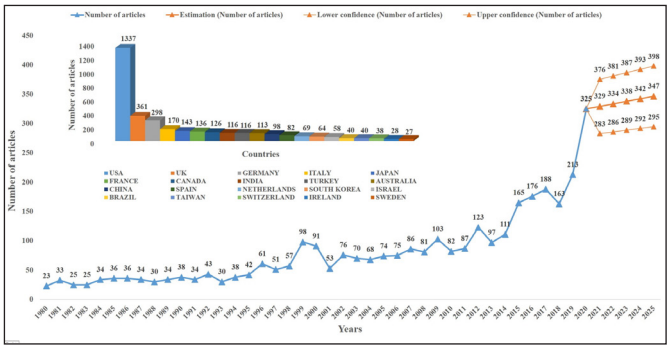

Figure 1. a. Distribution of articles on tracheostomy by years and estimation of articles in the coming years b. Top 20 countries in the world that have published the most articles on tracheostomy

Active Countries

The first 20 countries with the most articles on tracheostomy is shown in the column chart of **Figure 1**. These countries are; USA (1337, 37.4%), UK (361, 8.9%), Germany (298, 7.6%), Italy (170, 4.7%), Japan (143, 4%), France (136, 3.8%), Canada (126, 3.5%), India (116, 3.2%), Turkey (116, 3.2%), Australia (113, 3.1%), China (98, 2.7%), Spain (82, 2.2%), Netherlands (69, 1.9%), South Korea (64, 1.7%), Israel (58, 1.6%), Brazil (40, 1.1%), Taiwan (40, 1.1%), Switzerland (38, 1.0%), Ireland (28, 0.7%), and Sweden (27, 0.7%).

90 countries have produced publications. Among these countries, 44 countries were selected. The selected countries have produced at least 5 articles and had international cooperation among their authors. For the selected countries, the total link strength scores were calculated. The International Collaboration Density map is created based on these scores (**Figure 2.a**). The network visualization map of cluster analysis is shown in **Figure 2.b**. According to the results of the cluster analysis, six different clusters regarding international cooperation were found (Cluster 1: Austria, Canada, Czech Republic, Germany, Israel, Italy, Japan, Netherlands, Norway, South Korea, Sweden, Thailand. Cluster 2: Australia, Belgium, France, Ireland, Portugal, South Africa, Switzerland, Taiwan. Cluster 3: Croatia, Finland, New Zealand, China, Singapore, Turkey, USA. Cluster 4: Argentina, Brazil, Chile, Colombia, Greece, Spain, Venezuela. Cluster 5: Egypt, India, Pakistan, Saudi Arabia, United Arab Emirates. Cluster 6: Denmark, England, Scotland, Wales).

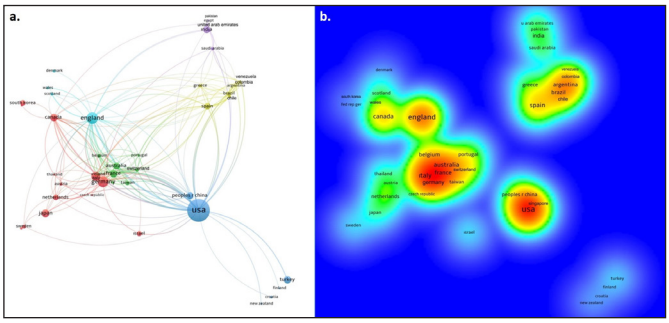

Figure 2. a. Network visualization map of cluster analysis on international collaboration between countries on tracheostomy. **Footnote:** Colors indicate clustering. The size of the circle indicates a large number of articles. **b.** Density map for international collaboration of countries on tracheostomy. **Footnote:** The strength of international collaboration score increases from blue to red (blue-green-yellow-red)

Correlation Analysis

There was a positive and statistically significant high correlation between the GDP and GDP per capita values of the countries and the number of articles (rgdp=0.717, p<0.001; rGDP per capita=0.701, p<0.001).

Active Authors

The top 10 most active authors with the most articles were Pandian V. (20), Leder SB. (19), Brenner MJ. (15), Byhahn C. (15), Johnson RF. (14), Pelosi P. (14), Westphal K. (14), Kluge S. (12), Lischke V. (12), and Mcgrath BA. (12).

Active Institutions

The 15 most active universities that produced the most articles on tracheostomy were determined. These universities were Harvard University (n=67), University Michigan (n=50), University of Pennsylvania (n=40), University Toronto (n=37), Yale University (n=37), University Washington (n=36), Northwestern University (n=34), University Pittsburgh (n=32), Johns Hopkins University (n=29), Boston Children's Hospital (n=27), Children's Hospital of Philadelphia (n=26), University of North Carolina (n=26), Medical College of Wisconsin (n=24), and Stanford University (n=24).

Active Journals

3573 articles on tracheostomy were published in 816 different journals. The first 34 most active journals that have 20 or more articles, the total number of citations received by these journals, and the average number of citations per article are presented in **Table 1**. The citation network visualization map between these journals is presented in **Figure 3.**

Table 1. The 34 most active journals that have published more than 20 articles on tracheostomy

Journals	RC	C	AC	Journals	RC	C	AC
Laryngoscope	189	3752	19.9	American Surgeon	32	706	22.1
International Journal of Pediatric Otorhinolaryngology	128	1497	11.7	Anaesthesia and Intensive Care	32	546	17.1
Otolaryngology-Head and Neck Surgery	121	1572	13.0	Critical Care	30	1218	40.6
Journal of Laryngology and Otology	87	711	8.2	Journal of Oral and Maxillofacial Surgery	30	395	13.2
Respiratory Care	75	1167	15.6	British Journal of Oral & Maxillofacial Surgery	28	360	12.9
Chest	70	4912	70.2	Journal of Trauma-Injury Infection and Critical Care	27	1310	48.5
Annals of Otology Rhinology and Laryngology	63	1547	24.6	Acta Anaesthesiologica Scandinavica	26	499	19.2
Critical Care Medicine	52	3460	66.5	HNO	26	94	3.6
Head and Neck-Journal for the Sciences and Specialties of the Head and Neck	51	782	15.3	Anesthesia and Analgesia	25	644	25.8
European Archives of Oto-Rhino-Laryngology	50	383	7.7	British Journal of Anaesthesia	25	597	23.9
Intensive Care Medicine	48	2162	45.0	JAMA Otolaryngology-Head & Neck Surgery	24	305	12.7
Pediatric Pulmonology	46	468	10.2	Laryngo-Rhino-Otologie	24	79	3.3
Anaesthesia	41	1028	25.1	Journal of Critical Care	22	316	14.4
Archives of Otolaryngology-Head & Neck Surgery	37	819	22.1	American Journal of Surgery	21	324	15.4
Indian Journal of Otolaryngology and Head & Neck Surgery	36	24	0.7	Journal of Otolaryngology	21	294	14.0
American Journal of Otolaryngology	34	295	8.7	Neurocritical Care	21	259	12.3
Annals of Thoracic Surgery	34	1003	29.5	Minerva Anestesiologica	20	240	12.0

RC: Record Count, C: Number of Citation, AC: Average Citation Per Document

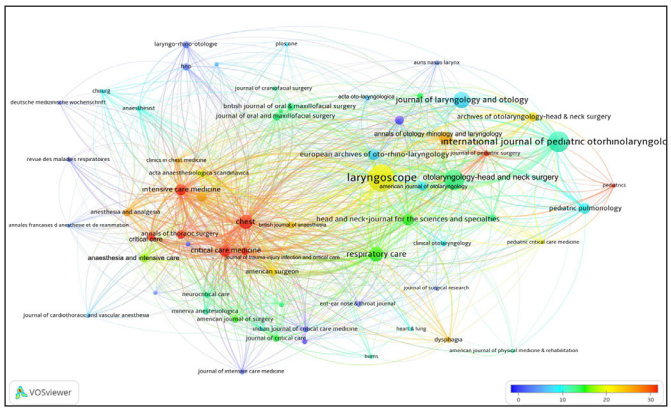

Figure 3. Network visualization map for citation analysis of active journals on tracheostomy. **Footnote:** The average number of citations per article by journals increases from blue to red (blue-green-yellow-red). The size of the circle indicates a large number of articles

Citation Analysis

The first 20 articles with the highest number of citations, out of 3573 articles published between 1980 and 2021, are presented in **Table 2**. The last column of **Table 2** presents the average number of citations per year.

Co-citation Analysis

In the references section of all 3573 articles, there are a total of 29551 studies cited. Among these studies, the first 9 studies that received the most co-citations (more than 150 citations) were Ciaglia (1985) (Number of co-citations (NC): 476), Rumbak (2004), (NC: 215), Griggs (1990) (NC: 196), Freeman (2000) (NC: 184), Stauffer (1981) (NC: 179), Griffiths (2005) (NC: 176), Hazard (1991) (NC: 172), Delaney (2006) (NC: 171) and Young (2013) (NC: 154) (2, 3, 15-21).

Trend Topics

4027 different keywords were used in all 3573 articles published on tracheostomy. Among these keywords, the most used 50 different keywords (used in at least 20 different articles) are shown in **Table 3**. The cluster network visualization map between these keywords is shown in **Figure 4**. The trend visualization network map is presented in **Figure 5** and the citation network visualization map is presented in **Figure 6**.

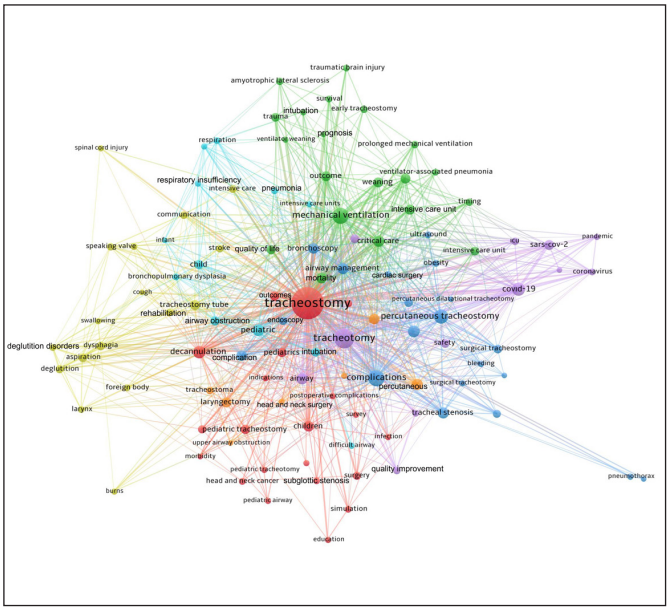

Figure 4. Network visualization map for cluster analysis based on keyword analysis on tracheostomy. **Footnote:** Colors indicate clustering. Keywords in the same cluster are of the same color. The size of the circle indicates the number of uses of the keyword

Table 2. The top 20 most cited articles on tracheostomy by total number of citations

No	Article	Author	Journal	PY	TC	AC
1	Complications and consequences of endotracheal intubation and tracheotomy - a prospective-study of 150 critically ill adult patients	Stauffer JL. et al.	American Journal of Medicine	1981	812	19.8
2	Elective percutaneous dilatational tracheostomy - a new simple bedside procedure - preliminary-report	Ciaglia P. et al.	Chest	1985	700	18.92
3	A prospective, randomized, study comparing early percutaneous dilational tracheotomy to prolonged translaryngeal intubation (delayed tracheotomy) in critically ill medical patients	Rumbak MJ. et al.	Critical Care Medicine	2004	430	23.89
4	Criteria for extubation and tracheostomy tube removal for patients with ventilatory failure - A different approach to weaning	Bach JR. et al.	Chest	1996	319	12.27
5	Obstructive sleep-apnea syndrome and tracheostomy - long-term follow-up experience	Guilleminault C. et al.	Archives of Internal Medicine	1981	318	7.76
6	Urinary catecholamines before and after tracheostomy in patients with obstructive sleep-apnea and hypertension	Fletcher EC. et al.	Sleep	1987	288	8.23
7	Effect of Early vs Late Tracheostomy Placement on Survival in Patients Receiving Mechanical Ventilation The tracman Randomized Trial	Young D. et al.	JAMA-Journal of the American Medical Association	2013	287	31.89
8	A simple percutaneous tracheostomy technique	Griggs WM. et al.	Surgery Gynecology& Obstetrics	1990	285	8.91
9	Early vs late tracheotomy for prevention of pneumonia in mechanically ventilated adult ICU patients a randomized controlled trial	Terragni PP. et al.	JAMA-Journal of the American Medical Association	2010	283	23.58
10	Early tracheostomy for primary airway management in the surgical critical care setting	Rodriguez JL. et al.	Surgery	1990	271	8.47
11	A meta-analysis of prospective trials comparing percutaneous and surgical tracheostomy in critically ill patients	Freeman BD. et al.	Chest	2000	266	12.09
12	Comparative clinical-trial of standard operative tracheostomy with percutaneous tracheostomy	Hazard P. et al.	Critical Care Medicine	1991	243	7.84
13	Comparison of percutaneous and surgical tracheostomies	Friedman Y. et al.	Chest	1996	223	8.58
14	Intermittent positive pressure ventilation via the mouth as an alternative to tracheostomy for 257 ventilator users	Bach JR. et al.	Chest	1993	198	6.83
15	Percutaneous dilatational tracheostomy - results and long-term follow-up	Ciaglia P. et al.	Chest	1992	198	6.6
16	Endoscopic guided percutaneous tracheostomy - early results of a consecutive trial	Marelli D. et al.	Journal of Trauma-Injury Infection and Critical Care	1990	194	6.06
17	Pediatric tracheotomies: Changing indications and outcomes	Carron JD. et al.	Laryngoscope	2000	184	8.36
18	Early tracheostomy versus prolonged endotracheal intubation in severe head injury	Bouderka MA. et al.	Journal of Trauma-Injury Infection and Critical Care	2004	182	10.11
19	Complications in pediatric tracheostomies	Carr MM. et al.	Laryngoscope	2001	178	8.48
20	Clinical predictors and outcomes for patients requiring tracheostomy in the intensive care unit	Kollef MH. et al.	Critical Care Medicine	1999	178	7.74

PY: Publication year, TC: Total citation, AC: Average citations per year

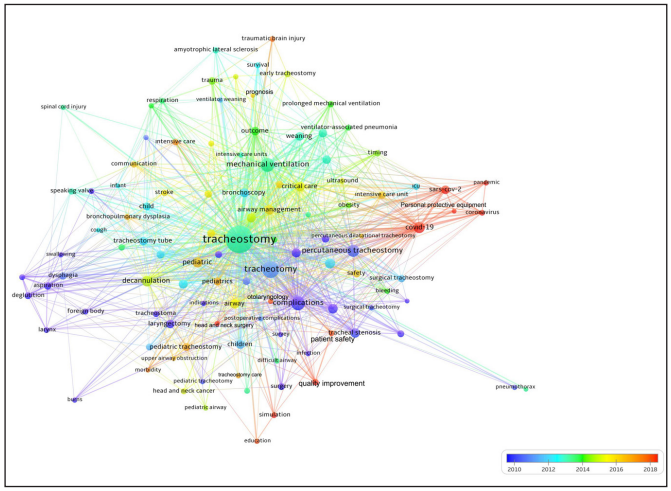

Figure 5. Network visualization map for trends on tracheostomy. **Footnote:** In the indicator given in the lower right corner of the figure, the topicality of the article increases from blue to red (blue-green-yellow-red). The size of the circle indicates the number of uses of the keyword

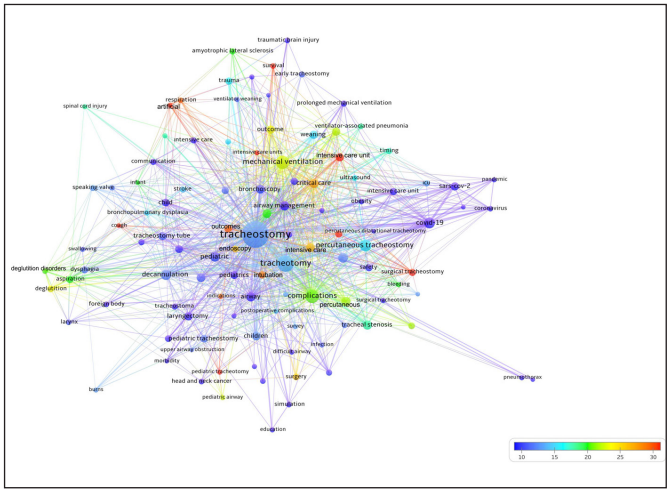

Figure 6. Network visualization map of the most frequently cited topics on tracheostomy. **Footnote:** In the indicator given in the lower right corner of the figure, the number of citations received by the topic increases from blue to red (blue-green-yellow-red). The size of the circle indicates the number of uses of the keyword

Table 3. The 50 most frequently used keywords in articles about tracheostomy

Keywords	Number of uses	Keywords	Number of uses
Tracheostomy	1282	Pediatric tracheostomy	41
Tracheotomy	317	Airway obstruction	39
Complication (s)	237	Aspiration	34
Mechanical ventilation	175	Surgical tracheostomy	34
Percutaneous tracheostomy	129	Intubation	33
Intensive care unit (s) (ICU)	127	Quality of life	33
Pediatric (s)	108	Ventilation	31
COVID-19	104	Dysphagia	30
Child / children	89	Percutaneous dilational tracheostomy	30
Decannulation	86	Safety	29
Outcome (s)	86	Trauma	29
Percutaneous dilatational tracheostomy	79	Endoscopy	25
Intensive care	78	Surgery	25
Airway management	64	Trachea	25
Critical care	64	Deglutition	24
Tracheal stenosis	63	Percutaneous tracheotomy	24
Airway	61	Amyotrophic lateral sclerosis	23
Percutaneous	61	Early tracheostomy	23
Mortality	56	Prolonged mechanical ventilation	23
Bronchoscopy	52	Quality improvement	22
Tracheostomy tube	50	Stroke	22
Weaning	50	Communication	21
Respiratory failure	46	Speaking valve	20
Laryngectomy	45	Timing	20
Sars-cov-2	44	Tracheostoma	20

DISCUSSION

Between 1980 and 1995, in each year the number of published articles on tracheostomy were between 0 and 50 (the average 34). Between 1996 and 2008, the number of articles was 50-100 (average 72). In 2009, the number of articles exceeded 100 and an average of 130 articles were published between 2009 and 2018. A remarkable upward trend was seen in 2019 and 2020, with 212 articles published in 2019 and 325 articles in 2020. When the Exponential Triple Smoothing forecast results are evaluated, it is seen that the number of articles will show an increasing trend.

The significant increase in the number of publications on tracheostomy in 2020 reveals the effect of the COVID-19 pandemic on respiratory failure. Tracheostomy is a frequently performed technique in critically ill patients who require long mechanical ventilation for acute respiratory failure and airway problems (1-3). The need for prolonged ventilation is frequently encountered, especially in COVID-19 patients hospitalized in intensive care (22-24). This bibliometric study reveals that the number of publications on tracheostomy has increased with the increase in COVID-19 cases. This shows that the number of patients who performed tracheostomy has increased with COVID-19.

When the distribution of countries' publications is examined, 16 of the first 20 are most active in article productivity on tracheostomy. These countries are also developed countries, while the other four (India, Turkey, China, Brazil) are developing countries. However, these four countries have relatively large economies. According to the results of the correlation analysis; a highly significant correlation was found between article productivity and economic development indicators. This shows that the economic development of the countries is effective in its productivity. The bibliometric studies carried out on some medical subjects in the literature also stated that economic development is effective in article productivity, similar to our results (5,6,25).

When the International Collaboration Density map based on total link strength scores (**Figure 2a**) was evaluated, the countries with the most intensive cooperation were determined as USA, UK, Italy, Germany, Canada, Australia, Spain, France, Ireland, Switzerland, Belgium, Brazil, Chile, Argentina, Colombia, Venezuela. When the co-authorship cooperation of the countries is examined, it is seen that the collaborations according to the geographical locations of the countries are effective in the production of articles (Germany, Italy, Austria, Netherlands, Czech Republic), (France, Belgium, Switzerland), (Brazil, Argentina, Venezuela, Colombia,

Chile), and (Egypt, Saudi Arabia, United Arab Emirates, Pakistan, India). On the other hand, among the countries that are in the same clusters but do not have geographical proximity (USA, China, Turkey), (Canada, Japan), etc. joint works have been done. Some studies in the literature have stated that geographical proximity is primarily effective in international cooperation (9,10).

The journals that publish the most articles on tracheostomy are Laryngoscope, International Journal of Pediatric Otorhinolaryngology, Otolaryngology-Head and Neck Surgery, Journal of Laryngology and Otology, Respiratory Care, Chest, Annals of Otology Rhinology and Laryngology, Critical Care Medicine, Head and Neck - Journal for the Sciences and Specialties of the Head and Neck, and European Archives of Oto-Rhino-Laryngology. We can suggest that authors who want to publish articles related to tracheostomy can consider these journals.

When the citation analyses of the journals are evaluated, the most effective journals according to the average number of citations per article are Chest, Critical Care Medicine, Journal of Trauma-Injury Infection and Critical Care, Intensive Care Medicine, Critical Care, Pediatrics, Journal of Pediatric Surgery, Annals of Thoracic Surgery, Anesthesia and Analgesia, Clinics in Chest Medicine, and Anaesthesia. We can suggest that researchers who want their articles to be cited more can consider these journals.

According to the total citation count, the average number of citations per year, and the most co-citations numbers; we can suggest that researchers can read the following articles; Stauffer et al. (2), Ciaglia et al. (3), Rumbak et al. (15), Bach et al. (16), Guilleminault et al. (17), McGrath et al. (18), Angel et al. (19), Young et al. (20), Martin-Villares et al. (21), Griggs et al. (26), Freeman et al. (27), Griffiths et al. (28), Hazard et al. (29), Delaney et al. (30).

When the keyword analysis findings are evaluated; the cluster analysis reveals that tracheostomy subjects were divided into 7 different clusters. These clusters are; red (related to pediatric), blue (related to complications), green (related to ventilation), yellow (related to tracheostomy tube), orange (percutaneous tracheostomy), purple (related to COVID-19), and turquoise (related to respiratory insufficiency).

The most cited keywords were intensive care unit, surgical tracheostomy, percutaneous dilational tracheostomy, outcomes, survival, intubation, pediatric tracheotomy, respiration, artificial, indications, and cough. According to trend topics analysis, the keywords studied in recent years are COVID-19, Coronavirus, Sars-Cov-2, pandemic, personal protective equipment, quality improvement, patient safety, education, simulation, head and neck surgery, otolaryngology, traumatic brain injury, and morbidity.

Our bibliometric study has identified the most popular studies, authors, and journals on tracheostomy. Thus, clinicians can have the opportunity to research tracheostomy more quickly and practically. Additionally, this bibliometric study can guide researchers for new articles on tracheostomy by highlighting the points they can focus on.

This study showed that the need for tracheostomy may increase in epidemics that may cause respiratory failure such as clinically COVID-19. Therefore, similar bibliometric analyzes on various pandemics and epidemics can guide clinicians in their approaches to diseases and make a serious contribution to the management of diseases.

As a result of the literature review on tracheostomy, we could not find any bibliometric study. It can be said that this comprehensive study we have done on this subject is the first bibliometric research. Only the WoS database was used in the literature review of our study. Pubmed database was not preferred because citation and co-citation analyzes could not be performed. Scopus database was not preferred, because the database includes journals with low impact levels. The reason why the WoS database is preferred is that Wos indexes the articles published in journals with higher impact factors than the other databases and comprehensive citation analyzes can be performed (10). In recent years, WoS has been preferred more in bibliometric analyzes (7-13). Additionally, if more than one database is used, the same articles in different databases can be included in the analysis more than once, therefore reliability can decrease.

CONCLUSION

This comprehensive bibliometric study on tracheostomy summarizes 3573 articles published between 1980 and 2021. There is an increasing trend in the number of articles following the COVID-19 pandemic. The trend topics in tracheostomy research are COVID-19, Coronavirus, Sars-Cov-2, pandemic, personal protective equipment, quality improvement, patient safety, education, simulation, head and neck surgery, otolaryngology, traumatic brain injury, and morbidity. This study showed that the need for tracheostomy may increase in pandemics such as COVID-19 which cause respiratory failure.

The tracheostomy technique has been applied for many years, as a result, the developments that have occurred over the years have led to different studies on tracheostomy. This article, summarizing the literature history on tracheostomy, can be a useful resource for clinicians and scientists.

ETHICAL DECLARATIONS

Ethics Committee Approval: Ethics committee approval is not required in this bibliometric study.

Informed Consent: Informed Consent is not required.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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